

Applicant: Nestor RODRIGUEZ-AMAYA et al.
Docket No. R.307522
Preliminary Amdt.

AMENDMENTS TO THE SPECIFICATION:

Page 1, please add the following new paragraphs before paragraph [0001]:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/EP 2005/050126
filed on January 13, 2005.

[0000.6] BACKGROUND OF THE INVENTION

Please replace paragraph [0001] with the following amended paragraph:

[0001] ~~Prior Art~~ **Field of the Invention**

Please replace paragraph [0002] with the following amended paragraph:

[0002] The invention is ~~based on a~~ **directed to an improved** high-pressure pump, in particular for a fuel injection system of an internal combustion engine, ~~as generically defined by the preamble to claim 1.~~

Please add the following new paragraph before paragraph [0003]:

[0002.5] Description of the Prior Art

Please replace paragraph [0003] with the following amended paragraph:

[0003] One ~~such~~ high-pressure pump is known from German Patent Disclosure DE 198 60 672 A1. ~~This high-pressure pump~~ has at least one pump element, with a pump piston, which is driven in a reciprocating motion and which defines a pump work chamber. In the intake stroke of the pump piston, via an inlet valve, fuel is aspirated from a fuel inlet, and in the pumping stroke of the pump piston, via an outlet valve, fuel is positively displaced out of the pump work chamber. The inlet valve has a valve member with a sealing face that is inclined relative to its longitudinal axis and with which it cooperates with a valve seat disposed in a

valve housing. The outlet valve has a spherical valve member, which cooperates with a valve seat disposed in a valve housing. By means of the applicable valve member, in the opened state when this valve member has lifted with its sealing face from the valve seat, a flow cross section is opened between the valve member and the valve housing. In the opened state of the valve, the smallest flow cross section between the valve member and the valve housing is located in the region of the sealing face of the valve member, and as a result there is a high flow velocity there and a correspondingly lower static pressure in the region of the sealing face and consequently only a slight force acting in the opening direction of the valve member. Depending on the stroke of the valve member and on the pressure difference, forces in the closing direction may even act on the valve member. For keeping the inlet valve open, a major pressure difference between the fuel inlet and the pump work chamber is therefore necessary, which in turn necessitates a high pressure in the fuel inlet and hence a correspondingly large-sized feed pump to generate this pressure. In the flow through the inlet valve, there is moreover a great pressure loss, making filling of the pump work chamber more difficult. This pressure loss corresponds to the required pressure difference for filling the pump work chamber. Because of the resultant hydraulic forces, the outlet valve has a tendency to vibrate, so that the outlet valve constantly opens and closes, which impairs the operating performance of the high-pressure pump and puts a heavy load on the high-pressure pump because of pressure peaks that occur in the pump work chamber when the outlet valve is closed.

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Page 2, please replace paragraph [0004] with the following amended paragraph:

[0004] ~~Advantages of the Invention~~

SUMMARY AND ADVANTAGES OF THE INVENTION

Please replace paragraph [0005] with the following amended paragraph:

[0005] The high-pressure pump of the invention ~~having the characteristics of claim 1~~ has the advantage over the prior art that to keep the inlet valve and/or the outlet valve open, only a slight pressure difference upstream and downstream of the valve is necessary, since because of the shift of the smallest flow cross section away from the sealing face outward in the region of the sealing face, a higher static pressure results, by which a strong force acting on the valve member in the opening direction is generated. The pressure in the fuel inlet can be kept relatively slight as a result, which makes a correspondingly smaller feed pump possible, and because of the lesser pressure losses in the flow through the inlet valve, the filling of the pump work chamber is improved. In the case of the outlet valve, the shifting of the smallest flow cross section assures stable opening, so that the load on the high-pressure pump is reduced.

Page 3, please replace paragraph [0006] with the following amended paragraph:

[0006] ~~In the dependent claims, advantageous~~ **Advantageous** features and refinements of the high-pressure pump according to the invention are disclosed. By means of ~~the one~~ **one** embodiment ~~defined by claim 2~~, the disposition of the smallest flow cross section downstream of the sealing face of the valve member is made possible in a simple way.

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Please replace paragraph [0007] with the following amended paragraph:

[0007] ~~Drawing~~ **BRIEF DESCRIPTION OF THE DRAWINGS**

Please replace paragraph [0008] with the following amended paragraph:

[0008] One exemplary embodiment of the invention is ~~shown in the drawing and~~ described in further detail ~~in the ensuing description. Fig. 1 shows a high-pressure pump for a fuel injection system of an internal combustion engine; Fig. 2 shows an inlet valve of the high-pressure pump enlarged and in longitudinal section; Fig. 3 shows a modified version of the inlet valve; and Fig. 4 shows an outlet valve of the high-pressure pump in a longitudinal~~ section: **herein below, with reference to the drawings, in which:**

Please add the following new paragraphs before paragraph [0009]:

[0008.2] Fig. 1 shows a high-pressure pump for a fuel injection system of an internal combustion engine;

[0008.4] Fig. 2 shows an inlet valve of the high-pressure pump enlarged and in longitudinal section;

[0008.6] Fig. 3 shows a modified version of the inlet valve; and

[0008.8] Fig. 4 shows an outlet valve of the high-pressure pump in a longitudinal section.

Please replace paragraph [0009] with the following amended paragraph:

[0009] ~~Description of the Exemplary Embodiment~~ **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Page 6, please replace paragraph [0013] with the following amended paragraph:

[0013] The bore portion 42d is embodied such that its diameter increases from the bore portion 42c toward the pump work chamber 24. The jacket face of the bore portion 42d is preferably embodied frustoconically, but may also be shaped in any other arbitrary way, for instance being concave or convex. The jacket face of the bore portion 42d is inclined by an angle β to the longitudinal axis 45 of the valve member 44. The angle β by which the jacket face of the bore portion 42d is inclined to the longitudinal axis 45 is less than the angle α by which the jacket face of the bore portion 42c is inclined to the longitudinal axis 45. At the transition between the bore portions 42c and 42d, an undercut 42e is preferably provided, to enable simple production of the two bore portions 42c and 42d with the different angle of inclinations α and β . The undercut 42e preferably has a jacket face extending at least approximately parallel to the longitudinal axis 45. The outer diameter of the head 46 of the valve member 44 is somewhat smaller than the diameter of the undercut 42e, so that with the edge at the transition from the head 46 to the sealing face 48, it the head can plunge into the undercut 42e somewhat in the closed state. By means of the undercut 42e, a collision between the head 46 of the valve member 44 and the valve housing 40 is thus avoided.

Page 11, please replace paragraph [0020] with the following amended paragraph:

[0020] Upon opening of the outlet valve 32, when its valve member 60 lifts with its sealing face 64 from the valve seat 54b, the surface area of the valve member 60 subjected to pressure is increased, since it is then no longer only the surface located inside the valve seat

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54b that is subjected to pressure, but ~~instead~~ also the larger surface area ~~with~~ toward the region 66. A high pressure force in the opening direction therefore acts on the valve member 60 and keeps the valve member 60 stably in its opened state, even if a large quantity of fuel is flowing through the outlet valve 32 at a high flow velocity. As the stroke of the valve member 60 lengthens in the opening direction, both the uncovered flow cross section between its sealing face 64 and the valve seat 54b and the flow cross section uncovered in the region 66 become larger; the flow cross section uncovered in the region 66 is always smaller than the flow cross section uncovered between the sealing face 64 and the valve seat 54b. The angle α , by which the valve seat 54b is inclined relative to the longitudinal axis 55 of the bore 54, can be selected as large, so that the valve seat 54b is relatively flat and thus has high wear resistance.

Page 21, please add the following new paragraph after paragraph [0021]:

[0022] The foregoing relates to a preferred exemplary embodiment of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.